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FOREST MANAGEMENT NOTE

Note 49 Northwest Region

TWO-WAY ASCII FILE TRANSFERS BETWEEN HP AND IBM COMPATIBLE MICROCOMPUTERS

Among the first microcomputers utilized in the early 1970s, particularly in forestry research, were those built and marketed by Hewlett Packard (HP)[1]. Microcomputers such as the HP 9825 were characterized by 8 Kilobytes (K) of RAM (later 64K), built-in HPL (Hewlett Packard Language) programming language and operating system, 16-character thermal printer, cassette tape drive, and single-line LED wrap-around screen. The HP 9825 was later replaced by the HP Series 200, models 16, 26, and 36, in the late 1970s and early 1980s. These computers were also commonly used by those working with large-scale photographs[2] and photo mensuration (Spencer and Hall 1988).

The proliferation of IBM or IBM-compatible microcomputers with the PC/MS-DOS and the wide availability of analysis software (e.g., spread sheets, statistics, and data bases) has made it highly desirable to transfer programs and particularly data files between HP and IBM computers for subsequent data processing. These file transfers would also open avenues for transfers to other micro-, mini-, and mainframe computers and use of peripherals such as laser printers or plotters. In both the forestry research and operational agency offices, previously created data files are being rekeyed rather than merely transferred because it has been difficult using existing HP documentation to determine the parameters for achieving full communication. This paper presents an overview of the computer programs and procedures developed for capture and transfer of ASCII files between an HP Series 200 microcomputer and a PC/MS-DOS based IBM or IBM compatible. It has been assumed that program and data files residing on an HP 9825 microcomputer have first been transferred to an HP Series 200 computer. Interface procedures and programs are already available and documented in the HPL Operating Manual (manual part number: 98614-90010). All HPL programs and data files were readily transferable to the Series 200, but the main supported language and operating system was HP BASIC.

HARDWARE ENVIRONMENT

Although many hardware configurations are possible, the hardware configuration necessary for file transfers at the Northern Forestry Centre (NoFC) includes an HP 9816 (Series 200, Model 16) microcomputer with 512K of RAM and the RS-232 compatible HP 98626 serial interface. A 386 IBM-compatible microcomputer containing a Phoenix ROM BIOS, 640K of conventional RAM, and an RS-232 serial interface communications port. The interface cable used was an HP RS-232 DTE cable with an RS-232 gender changer (female - female).

[1] The exclusion of certain manufactured products does not necessarily imply disapproval nor does the mention of other products necessarily imply endorsement by Forestry Canada.

[2] Spencer, R.D. 1984. Unpublished file report on technical review of large-scale photo sampling for forestry across Canada. Environ. Can., Can. For. Serv., North. For. Res. Cent., Edmonton, Alberta.

SERIAL CONFIGURATION PROBLEMS ENCOUNTERED

Hewlett Packard stopped supporting HPL in 1985, shortly after the introduction of the Series 200 microcomputers. HPL software support was therefore written for the HP 9825 with a few minor updates that related to the HP 9816. The interface documentation for the HP 9816 was minimal, and HP 9816 register maps were not available. The HP 9816 was also difficult to handshake[3] because there were no switches for the internal serial interface. This created problems for direct cable connections to an external device (e.g., another computer) since software corrections were not possible. Programs were therefore necessary to process the receive and transmit buffers of the serial interface card one character at a time.

SOFTWARE ON THE PC/MS-DOS IBM MICROCOMPUTER

All file transfers were handled by the communications software package PROCOMM+, from Data Storm Technologies[4]. PROCOMM+ was chosen because of its ASCII file transfer protocol, which provides several selectable ASCII file transfer settings. This includes the ability to control character and line pacing. Due to the faster speed of the IBM's 80386 central processing unit in comparison to the HP 9816, however, no handshaking was employed and the data transfer rate was reduced to prevent overrun (errors) from the HP. Other communications software packages may also be suitable if they have an ASCII file transfer protocol.

SOFTWARE ON THE HEWLETT PACKARD MICROCOMPUTER

Four separate programs were written and used depending on whether the file to be transferred was sent to or captured from the IBM PC or whether a program file was written in HP BASIC or HPL. The flowchart (Fig. 1) outlines the flow of procedures that has been developed. Depending on whether the program or data file was created using HP BASIC or HPL, the appropriate operating system must be available. The exception is that if the data file or the BASIC program has been saved as an ASCII data file both the HPL and HPBASIC systems can transfer the file to the IBM.

TRANSFER PROGRAMS

For the scope of this paper transfer programs will refer to the programs written on the HP microcomputer that send programs or data to the IBM/DOS microcomputer. There were two transfer programs written, one for the transfer of HPL programs from the HPL operating environment and one for transfer of ASCII files from the HP BASIC operating environment. Operating instructions and source code of both these programs are included.

HP BASIC to DOS Transfer Program

The HP BASIC to DOS program was written to facilitate the transfer of ASCII files from the HP microcomputer operating in the HP BASIC operating environment to the IBM microcomputer (Fig. 2). The IBM microcomputer must be running a DOS-based communications package such as PROCOMM+. This program will not expedite the transfer of non-ASCII files and therefore requires the conversion of all program and data files to the ASCII format.

User Instructions

1. Load the DOS operating system on the IBM microcomputer.

2. Load the HP BASIC operating system on the HP microcomputer.

3. Load and execute the HPBASICtoDOS program on the HP microcomputer.

4. Load and execute the PROCOMM+ program on the IBM microcomputer.

5. When the prompt Input the name of the data file? appears on the HP microcomputer, enter the name of the ASCII data/program file (with Mass Storage Indicator path if applicable).

6. On the IBM microcomputer and when the prompt
   PROCOMM OPERATOR SENDING ASCII FILE NOW
   You will have 1 minute before file transfer commences
   appears:
   Press the <Page Down> key on the IBM keyboard within 1 minute of receiving this message.

---

[3] Handshaking is the mechanism of timing to send and receive sequences of characters between a computer and a peripheral whose clock speeds are not exactly matched.

[4] Data Storm Technologies, P.O. Box 1471, Columbia, Missouri, U.S.A. 65205.

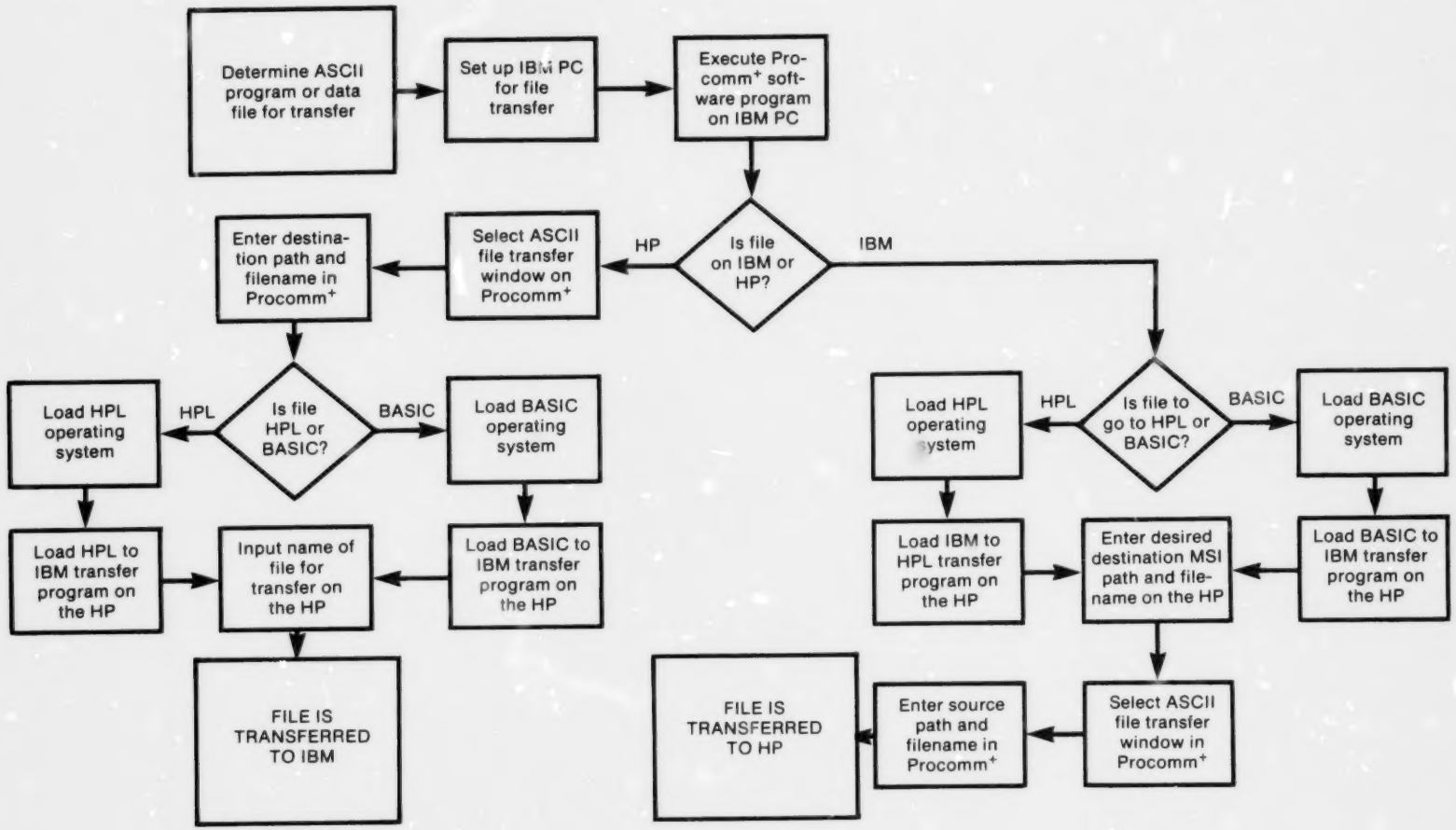
Determine ASCII program or data file for transfer
Set up IBM PC for file transfer
Execute Procomm+ software program on IBM PC
Is file on IBM or HP?
HP
IBM
Select ASCII file transfer window on Procomm+
Enter destination path and filename in Procomm+
Is file HPL or BASIC?
HPL
BASIC
Load HPL operating system
Load BASIC operating system
Load HPL to IBM transfer program on the HP
Input name of file for transfer on the HP
Load BASIC to IBM transfer program on the HP
FILE IS TRANSFERRED TO IBM
Is file to go to HPL or BASIC?
HPL
BASIC
Load HPL operating system
Load BASIC operating system
Load IBM to HPL transfer program on the HP
Enter desired destination MSI path and filename on the HP
Load BASIC to IBM transfer program on the HP
Select ASCII file transfer window in Procomm+
Enter source path and filename in Procomm+
FILE IS TRANSFERRED TO HP

Figure 1. ASCII file transfer flowchart.

```
100     DIM Stuff$[100]
101     INPUT "Input the name of the data file",Name$
120     ASSIGN @File1 TO Name$
130     Rs_232=9          ! Set the select code according to hardware
140     WRITEIO Rs_232,1;1          ! Reset the interface.
150     !
160     CONTROL Rs_232,4;3     ! Set the No. of stop bits/parity/databits
170                       ! stop bits = 1     parity = even databits = 7
180     CONTROL Rs_232,3;9600     ! set the baud rate to 9600
190     !
200     CALL Write_string("PROCOMM OPERATOR SENDING ASCII FILE NOW",Rs_232)
201     CALL Write_string("You will have 1 minute before file transfer commences", Rs_232)
202     WAIT 60
210     !
211     ON END @File1 GOTO Finish
221 Start:    !
222           ENTER @File1;Stuff$1
223           CALL Write_string(Stuff$,Rs_232)
224           GOTO Start
231 Finish:    !
300   END
320   SUB Write_string(String$,Rs_232)
330     Length = LEN(String$)
340     Cownt = 1
350     REPEAT
360       Register = READIO(Rs_232,27)
370       IF BIT(Register,5) = 1 THEN
380         Character = NUM(String$[Cownt;1])
390         WRITEIO Rs_232,17;Character
400         Cownt = Cownt + 1
410       END IF
420     UNTIL Cownt = (Length + 1)
430     WRITEIO Rs_232,17;13
440     WRITEIO Rs_232,17;10
450   SUBEND
```

Figure 2. HP BASIC to DOS transfer program listing.

7. The protocol selection window is displayed with the heading DOWNLOAD. Enter the number 4 to choose ASCII file transfer.

8. On the prompt for file name, enter the path and file name. If you enter a file that already exists, the received file will be renamed by placing a $ sign in the first position of the file name. If you enter the filename stat.dat, for example, if it already exists it will be renamed $tat.dat.

9. A message on the status line will indicate that an ASCII download is in effect.

10. When the data transfer is complete, press the <Esc> key on the IBM keyboard.

HPL to DOS Transfer Program

The HPL to DOS program was written as a driver for the transfer of HPL programs from the HP microcomputer to the IBM/DOS microcomputer (Fig. 3). The IBM microcomputer must have its own DOS-based capture software resident for communication to take place. PROCOMM+ was used, but any other communications software package would suffice. This program is

```
12:  % "The lines wti 0,9 and wti 3,2 sets the 98626A DTE cable so that"
13:  % "it will emulate the 98036A RS232C interface."
14:  wti 0,9
15:  wti 3,2
16:
17:  % "The line wsm 9,88,35 will do the following:"
18:  % " set stop bits : 1"
19:  % " set parity to : even"
20:  % " set character length to : 7"
21:  % " set request to send to pin #4"
22:  % " set Data Terminal ready to pin #6"
23:  % " Enable the Data Transmitter"
24:  wsm 9,88,35
25:  prt "The communications line is now open you can send data down it"
26:  end
```

Figure 3. HPL to DOS transfer program.

written for the transfer of HPL program files that are to be sent to the IBM microcomputer from the HPL operating system. If transfer of HPL environment ASCII data files is required, the transfer should be done from the HP BASIC operating environment with the HP BASIC to DOS transfer program. If other HPL environment data files must be transferred another program must be written that will utilize the HPL red and wrt commands.

User Instructions

1. Load the HPL operating system on the HP microcomputer.

2. Load the DOS operating system on the IBM microcomputer.

3. Load and execute the HPLtoDOS program on the HP microcomputer. Upon execution the memory registers are set and the communication lines between the HPL operating system and the DOS operating system are open.

4. Load and execute the PROCOMM+ program on the IBM microcomputer.

5. Load the HPL program to be transferred into the HP microcomputer memory.

6. Press the <Page Down> key on the IBM keyboard.

7. On the IBM microcomputer the protocol selection window is displayed with the heading DOWNLOAD. Enter the number 4 to choose ASCII file transfer.

8. When the prompt for file name appears on the IBM microcomputer, enter the path and file name. If you enter a file that already exists, the received file will be renamed by placing a $ sign in the first position of the file name. If you enter the filename stat.dat, for example, if it already exists it will be renamed $tat.dat.

9. A message on the status line of the IBM microcomputer will indicate that an ASCII download is in effect.

10. On the HP microcomputer enter the command list#9 (where 9 is the select code for the serial interface).

11. When the file listing is complete, press the <Esc> key on the IBM microcomputer.

CAPTURE PROGRAMS

For the scope of this paper capture programs will refer to programs written on the HP microcomputer that will read ASCII data sent by the IBM/DOS microcomputer and write it to a file. There were two capture programs written, one for the capture of ASCII data files containing HPL programs into the HPL operating environment, and one for the capture of ASCII data files into the HP BASIC operating environment. User

operating instructions and source code for both of these programs are included.

DOS to HP BASIC Capture Program

The DOS to HP BASIC capture program was written to facilitate the transfer of ASCII files from an IBM/DOS microcomputer to an ASCII file in the HP BASIC operating environment on the HP microcomputer (Fig. 4). The IBM microcomputer must utilize a communications package such as PROCOMM$^+$ to send the ASCII file. To compensate for the slower CPU on the HP microcomputer the data coming from the IBM/DOS microcomputer must be slowed down. It must be noted that not all communications packages have this ability.

User Instructions

1. Load the HP BASIC operating system on the HP microcomputer.
2. Load the DOS operating system on the IBM microcomputer.
3. Load and execute the DOStoHPBASIC program on the HP microcomputer.
4. Load and execute the PROCOMM$^+$ program on the IBM microcomputer.
5. When the prompt Input NAME of the incoming ASCII file appears enter the name of the file (including the Mass Storage Indicator path if applicable).
6. When the prompt Enter the number of records for this file appears enter the number of 256 byte records this file contains. If this information is not known, enter the number of lines in the ASCII file.
7. On the IBM microcomputer when the prompt PROCOMM operator send file : <filename> appears: Press the <Page Up> key on the IBM keyboard.
8. The protocol selection window is displayed with the heading UPLOAD. Enter the number 4 to choose ASCII file transfer.
9. On the prompt for file name enter the path and file name.
10. Another window will now open and report the progress of the transfer.

DOS to HPL Capture Program

The DOS to HPL capture program was written as a driver for the capture of ASCII files containing HPL syntax programs into the HPL operating environment (Fig. 5). The ASCII files are sent from the IBM/DOS computers using a DOS-based communications package such as PROCOMM$^+$. If the transfer of ASCII data files to the HPL operating environment is required, the ASCII files should be sent to the HP BASIC operating environment and captured with the DOS to HP BASIC program.

User Instructions

1. Load the HPL operating system on the HP microcomputer.
2. Load the program DOStoHPL[5] into the memory of the HP microcomputer.
3. Execute the program.
4. On the IBM microcomputer when the prompt PROCOMM operator send file : <filename> appears: Press the <Page Up> key on the IBM keyboard.
5. The protocol selection window is displayed with the heading UPLOAD. Enter the number 4 to choose ASCII file transfer.
6. On the prompt for file name, enter the path and file name.
7. Another window will now open and report the progress of the transfer.
8. When the transfer is complete, go to the HP microcomputer and enter edit mode. Once in edit mode, delete the first 11 lines, which is the DOStoHPL program.
9. Exit the edit mode and save the file.

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A.R. Kruger
May 1990

REFERENCE

Spencer, R.D.; Hall, R.J. 1988. Canadian large-scale aerial photographic systems (LSP). Photogramm. Eng. Remote Sensing 54(4):475-482.

[5] This is the same program that is used in the transfer of program files between the HP 9825 and the HP 9816. A slight modification that sets up the registers of the serial interface to allow communication has been added.

```
100     DIM Mess$[80],Name$[40],Stuff$[80]
110     INPUT "Input the NAME of the incoming ASCII file",Name$
111     INPUT "Enter the number of records for this file",Rec
113     ON ERROR GOTO Continue
114     CREATE ASCII Name$,Rec
115   Continue:    !
116     OFF ERROR
120     ASSIGN @File1 TO Name$
130     Rs_232=9          ! Set the select code according to hardware
140     WRITEIO Rs_232,1;1          ! Reset the interface.
150     !
160     CONTROL Rs_232,4;30     ! Set the No. of stop bits/parity/databits
170                       ! stop bits = 1     parity = even databits = 7
180     CONTROL Rs_232,3;9600     ! set the baud rate to 9600
190     !
191     Mess$ = "PROCOMM operator send file :" &Name$
200     CALL Write_string(Mess$,Rs_232)
210     !
211     Stuff$ = " "
221       WHILE LEN(Stuff$) >0
230         CALL Build_string(Stuff$,Rs_232)
240         PRINT Stuff$
280         OUTPUT @File1;Stuff$
281         CALL Write_string(Stuff$,Rs_232)
290       END WHILE
300   END
310   !
320   SUB Write_string(String$,Rs_232)
330     Length = LEN(String$)
340     Cownt = 1
350     REPEAT
360       Register = READIO(Rs_232,27)
370       IF BIT(Register,5) = 1 THEN
380         Character = NUM(String$[Cownt;1])
390         WRITEIO Rs_232,17;Character
400         Cownt = Cownt + 1
410       END IF
420     UNTIL Cownt = (Length + 1)
430     WRITEIO Rs_232,17;13
440     WRITEIO Rs_232,17;10
450   SUBEND
460   !
470   SUB Build_string(Stuff$,Rs_232)
480       !
490       Index = 1
500       Stuff$ = " "
510       REPEAT
520         Register = READIO(Rs_232,27)     ! Check to see if a character is in the
530                           ! receive buffer.
540         IF BIT(Register,0) = 1 THEN
550           CALL Read_char(Character,Rs_232)
```

Figure 4. DOS to HP BASIC capture program.

Continued on next page.

```
560           SELECT Character
570             CASE 13
580             CASE 10
590             CASE ELSE
600               Stuff$[Index] = CHR$(Character)
610               Index = Index + 1
620           END SELECT
630         END IF
640       UNTIL (Character = 13)
650   !
660   SUBEND
670   !
680   SUB Read_char(Character,Rs_232)
690       !
700       ! The following reads the character and stores it in the
710       ! variable "Character"
720       !
730       Character = READIO(Rs_232,17)
741   SUBEND
```

Figure 4. concluded.

```
 0:  wti 0,9;wti 3,2;wsm 9,88,35
 1:  ent "Enter the Select Code of the Downloader",S
 2:  "Loader":dim A$[D85],nal,N
 3:  "input":red S,A$;if len (A$)<=2;gto "input"
 4:  if A$[1,1]="*";gto "done"
 5:  "store":on err "error";store A$,nal
 6:  gto "input"
 7:  "error":"%"&A$,A$;gto "store"
 8:  "done":
 9:  prt "Delete Lines 0 thru 11 and save the file to the"
10:  prt "disk."
11:  end
```

Figure 5. DOS to HPL capture program.

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